

PATENT CLAIMS

1. An active impact protection system for a knee area and/or lower leg area of a vehicle occupant in a motor vehicle, in particular a passenger vehicle, having an impact element (2) which is extensible by means of a driving device (4) out of a passive position into an active position in the direction of the vehicle occupants and is formed by a lid (impact lid) (2) of a passenger-side glove compartment (3),  
characterized in that
  - the glove compartment (3) has a stowage container (7) which is adjustable by means of the driving device (4) together with the impact lid (2) between a retracted closed position in which the impact lid (2) is in its passive position and an extended open position, in which the stowage container (7) is accessible,
  - in operation of the glove compartment, the driving device (4) moves the impact lid (2) together with the stowage container (7),
  - for activation of the impact lid (2), the driving device (4) extends the impact cover independently of the stowage container (7).
2. The impact protection system according to claim 1, characterized in that  
the driving device (4) is designed so that it moves the impact lid (2) essentially bidirectionally and/or one-dimensionally.
3. The impact protection system according to claim 1 or 2,

characterized in that

- the driving device (4) has a drive train (9) for moving the impact lid (2), which is designed so that it permits retraction of the impact lid (2) into its passive position in the event of a force (15) acting on the impact lid (2) from the outside in the direction of retraction,
  - the driving device (9) has at least one damper element (14) which is inserted into the drive train (9) and cooperates with the latter in such a way that it dampens a force (15) acting on the impact lid (2) from the outside and driving the impact lid (2) into its passive position.
4. The impact protection system according to claim 3, characterized in that
- the damper element (14) is activatable and deactivatable,
  - the damper element (14) is activated only when the impact lid (2) is extended, whereas it is deactivated during active retraction and extension.
5. The impact protection system according to any one of claims 1 through 4, characterized in that
- the driving device (4) extends the impact lid (2) during its activation until reaching a maximally extended end position or until a contact sensor or a control unit of the driving device (4) detects contact with an obstacle.

6. The impact protection system according to any one of claims 1 through 5,  
characterized in that  
to activate the impact lid (2) a pre-crash sensor is provided, whereby the driving device (4) retracts the impact lid (2) back into the passive position when the presumed crash fails to occur.
7. The impact protection system according to claim 6,  
characterized in that  
the driving device (4) is designed so that the rate of retraction for deactivation of the impact lid (2) is lower than the rate of extension for activation of the impact lid (2).
8. The impact protection system according to any one of claims 1 through 7,  
characterized in that  
the impact lid (2) functions as a mobile impact protection system (1) which is also moved in the event of a crash until reaching its passive position, and then in its passive position, it forms a stationary, energy-absorbing, deformable impact protection system (1).
9. The impact protection system according to any one of claims 1 through 8,  
characterized in that  
the driving device (4) is designed so that the rate of adjustment for opening and closing the stowage compartment (7) is lower than the rate of extension in activation of the impact lid (2).
10. The impact protection system according to any one of claims 1 through 9,  
characterized in that

the stowage container (7) is designed as a retractable and extensible drawer.

11. The impact protection system according to any one of claims 1 through 10, characterized in that the driving device (4) extends the impact lid (2) into a predetermined preventive position when the passenger has not engaged his seatbelt while the vehicle is being driven.
12. The impact protection system according to claim 11, characterized in that the driving device (4) stops the extension of the impact lid (2) into its preventive position when a contact sensor senses contact with an obstacle.
13. The impact protection system according to claim 11 or 12, characterized in that the impact lid (2) cooperates with a visually discernible warning to engage the seatbelt, such that the impact lid (2) conceals said warning in its passive position and releases the view of the warning when moved into its preventive position.
14. The impact protection system according to any one of claims 11 through 13, characterized in that the driving device (4) automatically retracts the impact lid (2) into the passive position as soon as the passenger has engaged his seatbelt.
15. The impact protection system according to any one of claims 11 through 14, characterized in that

the driving device (4) is designed so that the rate of adjustment for adjusting the impact lid (2) into its preventive position and back is lower than the rate of extension in activation of the impact lid (2).

16. The impact protection system according to any one of claims 1 through 15, characterized in that a clamping sensor stops the retraction movement of the impact lid (2) when it senses contact between the impact lid (2) and an obstacle.

ACTIVE IMPACT PROTECTION SYSTEM

The present invention relates to an active impact protection system for a knee area and/or a lower leg area of a vehicle occupant in a motor vehicle, in particular in a passenger vehicle, having the features of the preamble of Claim 1.

Such an impact protection system is known from U.S. Patent 6,283,508 B1, for example, and includes an impact element that is movable by a driving device out of a passive position and into an active position in the direction of the vehicle occupants. This impact element may be formed by a lid of a passenger-side glove compartment. This impact lid cooperates with the driving device so that a stowage compartment of the glove compartment does not move along into the active position when the impact lid is deployed, but instead it remains in its starting position.

Another impact protection device is known from EP 0 885 783 A1, in which the impact element may also be formed by a lid of a passenger-side glove compartment. The driving device, which is formed by an inflatable airbag, is also arranged so that in the event of a crash the impact lid can be adjusted suddenly into the active position together with a stowage container of the glove compartment. German Patent DE 100 58 430 A1 discloses an extensible restraint device for preventing and/or reducing impact injuries to vehicle occupants in an accident-induced deceleration of the vehicle; said device includes an impact element which can be moved from a resting position in the vehicle body in the direction of the occupant of the vehicle. To do so, a drive is provided, making it possible to move the impact element between a retracted passive position and an extended active position. This means that in the event of a crash, the impact element actively moves

forward toward the occupant of the vehicle and/or the knee area and/or lower leg area of the passenger. Therefore, a greater distance is available for deceleration of the respective vehicle occupant, so that the effective braking forces and thus the risk of injury can be reduced.

DE 197 49 585 A1 discloses a passive impact protection system having an energy-absorbing impact element. In contrast with active impact protection, the impact element in passive impact protection remains essentially in its installed position, so the respective vehicle occupant comes in contact with the stationary impact element at a rather high relative speed in the event of a crash. With the known passive impact protection, the stationary impact element is formed by the lid of a floor airbag.

DE 100 38 567 A1 and DE 100 55 051 A1 disclose other passive impact protection devices with which a stationary impact element is formed by the bottom of a compartment that is open toward the interior of the vehicle.

The present invention is concerned with the problem of providing an improved embodiment for active impact protection of the type defined in the preamble that can be integrated visually in particular into the automotive interior.

This problem is solved according to this invention by the object of the independent claim. Advantageous embodiments are the object of the dependent claims.

This invention is based on the general idea of designing a lid of a glove compartment as an actively adjustable impact element. Due to this design, the glove compartment lid, which is referred to below as the impact lid, has an important additional function for personal safety. Since a

glove compartment lid is integrated into the interior of a vehicle interior as a design element anyway, the design according to this invention yields a visually advantageous integration of the impact element into the automotive interior.

According to this invention, glove compartment has a stowage container which is adjustable by means of the driving device of the impact lid together with the impact lid itself between a retracted closed position, in which the stowage container is closed and in which the impact lid is in its passive position, and an extended open position, in which the stowage container is accessible from the interior of the vehicle. With this combination of features, the driving device has the additional function of permitting an increase in comfort. With this invention, the driving device can move the impact lid together with the stowage container when the glove compartment is operated, whereas to activate the impact cover, the driving device extends the impact cover independently of the stowage container. As a result of this measure, the impact lid can be extended especially rapidly in the event of a crash, because the mass of the stowage container and the contents accommodated therein must not be moved along with the lid when the impact cover is activated.

A driving device for adjusting the impact lid may essentially be designed so as to yield suitable adjustment kinematics for the impact lid. However, an embodiment in which the driving device is designed so that it moves the impact lid essentially bidirectionally and unidirectionally has proven especially advantageous. In the event of a crash, this yields a uniform orientation of the braking forces or deceleration forces applied by the impact lid with respect to its direction of action.



In one embodiment, the driving device may have a drive train for moving the impact lid, the drive train being designed so that it permits the impact lid to be retracted into its passive position when a force is acting from the outside on the impact lid in the retraction direction, whereby the driving device has at least one damper element which inserted into the drive train and cooperates with it so that it dampens a driving force acting on the impact lid from the outside and propels the impact lid into its passive position. This means that the deceleration force and/or braking force generated by the impact protection system in the event of a crash depends on the speed with which the vehicle occupant propels the impact lid in its direction of retraction with his knees and/or lower legs.